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ORIGINAL ARTICLE

Increasing research capacity in the chiropractic profession: *A case study and evaluation of an innovative research program in Norway*

Lise R. Lothe, DC, MSc, and Jennifer E. Bolton, PhD

Objective: The subject of research methods is not commonly covered in continuing professional development (CPD) courses in spite of its emphasis in undergraduate education. This initiative aimed to develop postgraduate research competency and recruit chiropractors to musculoskeletal research.
Methods: The program was delivered as a university-based program with 20 credits over seven contact weekends covering topics of evidence-based practice, research methods, statistics, ethics, resources, and funding. Students were assessed through assignments showing competency in critical literature review, case report writing, and production of a research protocol as the final assessment. Non-student participation for CPD points was possible. A student evaluation survey was completed after the end of the academic year.
Results: There were 26 participants: 16 as students handing in assignments, 10 as non-student participants for up to 94 CPD points. Three submitted a final protocol and two registered at a university PhD program. A network of research clinics was established for data collection for future multicenter studies.
Conclusions: The program was well received by the participants and gave them the tools and resources to perform research. The two-level attendance system afforded a basis for setting up a network of research clinics with a fundamental understanding of optimal data collection. This initiative has shown that research skills can be revisited through CPD programs as part of evidence-based lifelong learning.

Key Indexing Terms: Chiropractic; Continuing; Education; Research

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INTRODUCTION

The Norwegian Research Workshop is an initiative from the Norwegian Chiropractors' Association (NCA) as a response to the need to increase research and upgrade research qualifications for the chiropractic profession in Norway. Developing research competency in potential future teaching staff is closely linked to the commencement of the proposed chiropractic education in Norway.[1] Chiropractic researchers have contributed substantially to the existing evidence in the management of low back pain, neck pain, headache, and other conditions, [2] but in relation to the scope of chiropractors' contributions to health care services there is a large and unmet need for research activity within the field of chiropractic practice.[3]

All chiropractic education curricula in Europe must include elements for training students in scientific thinking and research methods.[4] Critical appraisal of the research literature is an integral part of evidence-based practice taught to undergraduate students. As with all health care education the emphasis is for the student to learn clinical skills and have an understanding of research in order to use the available evidence to solve clinical issues, not necessarily to perform research in clinical practice. When in practice, clinicians read the literature and undertake continuing professional development (CPD) courses to keep their knowledge up to date. CPD programs rarely offer research-competency enhancement beyond the MSc level. Only a few programs provide continuing education courses for clinicians designed to maintain research skills from undergraduate education, let alone enhance research skills by providing research methods as part of CPD programs.

To fully appreciate and implement evidence-based practice, clinicians must understand different forms of clinical research design and the appropriate research designs to answer particular types of clinical questions.[5] This program set out to not only develop skills in clinical research design, data collection, and data analysis but also

to prepare the clinician to identify potential areas for research inquiry and to systematically plan a research investigation relevant to an area of chiropractic practice. The program was intended to give the participant the foundation for developing the necessary skills for planning a PhD research project alone or as part of a research group. Here we present the research program offered and the results from the participants' evaluations of the program.

METHODS

Program Preparation and Promotion

The program Musculoskeletal Research was developed as a collaborative effort between the Research Committee of the NCA, the faculty of Social Sciences at the University of Stavanger, the Anglo European College of Chiropractic (AECC), and with valuable contribution from the Nordic Institute of Chiropractic and Clinical Biomechanics. The program was developed based on similar courses at AECC. The target groups were chiropractors who wanted to learn more about how to systematically tackle issues pertaining to clinical research and evidence-based practice, and clinicians who were interested in conducting a PhD study in the future or who were in the process of deciding whether a research career was appropriate. Only chiropractors with a degree from an institution accredited by the European Council on Chiropractic Education or another member agent of the Councils on Chiropractic Education International were eligible for participation.

The project was supported financially by the European Chiropractors Union (ECU), and chiropractors from all ECU-member countries were invited to attend the program through the ECU newsletter. The attendance fee for seven contact weekends was subsidized by the NCA for the Norwegians attendees who also provided a personal attendance fee. Furthermore, the Norwegian attendees completing the program as students were able to apply for reimbursement of their expenses from the Norwegian chiropractors CPD fund. There were several interested chiropractors from other countries but, due to travel expenses and attendance cost, none signed up for the program. This concurs with the reasons for not attending CPD programs in a study of attitudes toward and perceptions of CPD.[6]

Participants were allowed to sign up for the program at one of two levels: (1) as students, submitting assignments and receiving European Credit Transfer and Accumulation System (ECTS) points from the University of Stavanger, or (2) as non-student participants receiving CPD points for the hours attended through the European Academy of Chiropractic.

Program Content, Format, and Assignments

The aim of the program was to enhance the level of research competency in the chiropractic profession. The end goal was to produce a protocol for a viable research project that could be used as documentation in the search for supervisors and collaborators, and to seek funding for PhD positions. Successful funding of a research study creates opportunities for employment with a research facility. In order to reach this goal the participants were prepared by attending a set of lectures and workshops, and by completing assignments. A minimum 85% attendance was required. A major part of the material used for teaching in four of the seven contact weekends was identical to the modules Evidence-based Practice and Research Methods offered at AECC, and it was taught by AECC staff. The learning objectives for this course series are presented in Table 1.

The assignments for the modules were identical to the AECC assignments and allowed for transfer of academic ECTS points for students attending an MSc program at AECC. The Evidence-based Practice module was assessed based on a 2500-word critical literature review as well as a 2500-word case report, both of publishable quality for 10 master level ETCS credits. The Research Method module was assessed by a research proposal and a presentation of the proposal at a mini-symposium held on the last contact weekend. All participants played an active role both as presenters and as evaluators providing feedback to fellow students on content and presentation technique.

Resources

The program consisted of two units with seven contact weekends where a mix of lectures and workshops was used to give the participants the necessary tools to critically evaluate the research literature, develop valid research questions from clinical practice, and write a PhD research proposal. Relevance for the patient and other stakeholders was emphasized. The home assignment between contact weekends aimed to reinforce the content being taught, and the take-home exam aimed to give the participant an opportunity for reflective learning relevant to clinical practice.

In addition to the AECC modules the students received input from researchers at Nordic Institute of Chiropractic and Clinical Biomechanics. Students were introduced to the library services at the University of Stavanger, including given access to full text articles and biomedical search engines. They were taught how to use reference management software and were introduced to a statistical package. One weekend was dedicated to statistics with emphasis on factor analysis. The program included discussions of patient data registration, research ethics, and information on how to seek ethics approval. In addition the participants were introduced to the topic of where and how to apply for research funding, from both local and European sources. The participants were given an extensive reading list of relevant literature between contact weekends supplementing the literature that each participant had to seek out as part of the background literature search for the PhD protocol.

The program was continuously monitored through student evaluations following each contact weekend, and changes were made where necessary and appropriate throughout the year. A survey was performed at the conclusion of the academic year giving the students a chance to evaluate the program. The survey was developed

Table 1 - A Description of Learning Outcomes and Contact Hours for Each Module Spread Over Seven Contact Weekends

Modules	Contact Hours	Learning Objectives
Evidence-based practice	22	Understand the principles of evidence-based practice and how these are translated into clinical practice Find useful information from the research literature to answer a clinical question about individual patients Read research papers and make sense of them Transfer research findings (evidence) out of the research setting and into clinical practice Apply research evidence to solve a clinical problem from actual patients Identify research topics from clinical practice where the evidence is lacking
Research methods	22	Perform a literature review for PhD protocol Peer review articles using a critical evaluation tool Understand the philosophy of research inquiry and the two paradigms of quantitative and qualitative research Match a research question to the best design Collect data in practice settings Analyze numerical data and make sense of literal data
Statistics	26	Be able to apply multivariate analysis techniques relevant to doctoral research using the program package SPSS Master the practical use of some of the key analytical techniques in empirically oriented disciplines. Have the ability to critically evaluate the methods that are relevant to a given problem Have a sound relationship to the principles of quality in empirical research
Ethics, research topics, research services, and funding opportunities	24	Get an overview of research challenges regarding the clinical biomechanics of the spine Be prepared to participate in the empirical methods debate and to critically evaluate empirical scientific research Understand the rules and application process regarding data acquisition and ethics approval Obtain an overview of national and international research funds and how to apply Be able to use reference manager software and library services Write up a research study and publish it Perform a podium presentation Understand impact factor of biomedical journals Know where to seek reliable information and where to publish

using questions from the Education Question Bank certified and created by SurveyMonkey (Survey Monkey, Portland, OR, USA), the form used for evaluation of comparative courses at AECC, as well as questions particular to this course attempting to use methodologically sound questions but did not go through any validation process. Both open- and closed-ended questions were asked in order to discover the responses that individuals gave spontaneously and to avoid the bias that may have resulted from suggesting responses to individuals. The open-ended responses given here did not undergo qualitative evaluation and were merely used to underpin the closed-ended responses. The survey was piloted and revised by two chiropractors external to but familiar with the program. The Norwegian Social Science Data Services (NSD) endorsed the survey, which was deemed to be exempt from ethics approval. Participants were invited to answer the survey online after the end of the program. Up to three reminders were sent by e-mail and there was one non-responder. This survey instrument is available as supplemental material to this article online at www.journalchiroed.com.

RESULTS

Participation

A critical mass of human resources is necessary to create an environment for research. The organizers realized that in order to obtain a few PhD projects of high quality it was necessary to invite more people than were expected to participate as students. The participants had the option of attending as a student collecting a possible 10+10 ECTS points if assessments were passed or as a course participant collecting CPD points. Twenty-six (10 female, 16 male) chiropractors followed the program (Fig. 1).

Sixteen participants completed the first part for 10 M-level ECTS points. Five of the 16 entered the program initially as CPD participants but changed their status to 'Student' and submitted assignments. There were five students who changed their status to 'Non-student' CPD participants and did not submit assignments.

Twelve students submitted a research protocol for the final assignment but none were sufficiently developed into a protocol at the PhD level at first submission. It was

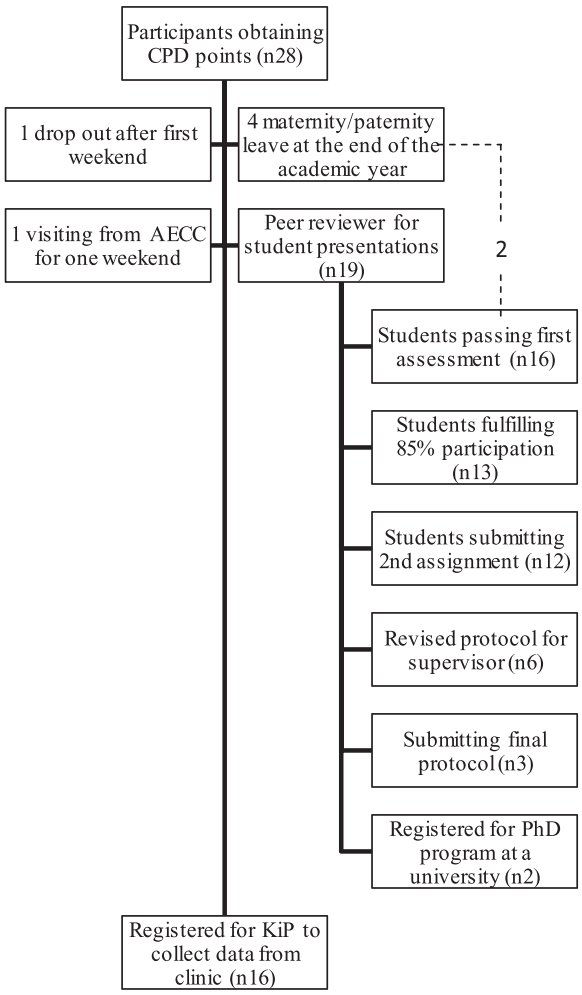

Figure 1 - Flow chart showing participation and academic achievements during the program. KIP is a network of research clinics established by the participants enabling data collection to future multicenter studies. CPD; continuing professional development.

apparent that the students needed help to improve their protocols. All students were offered help from a supervisor and were assigned one after resubmitting the protocol. Six students took the opportunity to resubmit and three of those chose to work with a supervisor. Two students signed up for and were accepted into a PhD program at a Norwegian university.

When asked the reason for participation it was apparent that the respondents entered the program with differing intentions and most did not know what they had embarked on. Twenty-two of 27 participants considered the opportunity to gain knowledge in how to critically assess the research literature as a reason for participation. Two in three gave learning how to implement research in clinic as well as helping to decide on a research career as a reason for participation. Interestingly, becoming involved in research for the benefit of the profession was given as a reason by two-thirds of participants, indicating a strong willingness to contribute to the research base for the profession. Half wished to gain knowledge in how to search the literature and to perform research despite many stating that this had been thoroughly covered during their chiropractic undergraduate education. One in three gave as a reason learning how to write a research protocol; gaining insight into how practice can be improved; and qualifying as a research clinic. One in four set out to use the ECTS points as part of a future PhD. Eight also gave as a reason the ability to use the modules as part of continuing education. A total of 1895 CPD hours were obtained by this group with a median of 77 CPD points (range 41–94).

Assessments

Most students considered the assignments relevant and useful and that they allowed learned skills to be applied. Most students found the assignments to be extremely or very useful in helping to understand the material. Only one student found the assignment to be easy, but most answered that they had been given the correct number of assignments. One student summed it up:

> "The EBP and Critical Review papers were good to do to get practical training in using the knowledge gained during lectures and reading. The protocol assignment was too much to ask given the lecture material covered."
> Q4 A6

In spite of the relatively few protocols that were completed, most participants were of the opinion that the program prepared them for writing a protocol. Thirteen participants felt they were moderately well-prepared, 10 very well, and one extremely well.

Support Services

The responses reflected general satisfaction when asked to comment on the learning and teaching materials, use of the e-learning platform, teaching methods, and tutors.

All participants were encouraged to obtain a mentor who could support them thorough the program. This person had to be someone who was not affiliated with the program. The idea was to have a friendly sparring partner to inspire and monitor progress in the program. No effort was made to educate the mentors in mentorship. The participants that made use of this facility found having a mentor very or extremely important (5 of 26).

All students were able to access the university library service off campus. Initially there were log-in difficulties, which may account for the low score in question 19, "How easy is it to obtain the resources from the library system"? Three of the 26 respondents answered "Not at all easy," six answered "Slightly easy," and nine answered "Moderately easy," while only eight answered "Very easy." Having access to full-text articles is essential for all levels of research from planning to completion. In order to use the literature in evidence-based practice there is a need to access subject-specific databases, such as the MANTIS database. This is particularly important in a profession with a developing research base.

"Lack of access annoying...."
Q22 A6

The University of Stavanger uses an e-learning platform for communication, assignment submission, and access to learning materials such as presentations and handouts. Becoming familiar with how to use this system was another challenge for the older students, but it was generally well received by those using it actively.

Mini-symposium

The last contact weekend was organized as a mini-symposium. As part of the last assessment each student presented their project protocol and received feedback from colleagues as well as a panel of experts. Each participant graded the presentations as part of the learning process. When asked to comment on the experience of presenting, all answers were positive:

"Even though I do not like presenting, I found this experience particularly useful. I enjoyed presenting and the feedback was helpful."
Q25 A4

When asked to comment on the experience as a peer reviewer giving feedback to the students presenting, a majority (18 of 26) answered and comments were generally positive:

"It was good experience, because you felt that you had some "new eyes" on how to evaluate research ideas. I felt that I could differentiate between a good idea and an idea that did not have the possibilities to become a good project. Either because it was too difficult and the research question was too vague, or because the project wouldn't give us any clear answers."
Q26 A2

"Helped to keep one focused on the presentations."
Q26 A8

Qualifications and Outcomes

As clinical research is dependent on valid data collection, part of the program was aimed at creating an interest in developing a network of research clinics. A task force from the non-student participants was formed during the program and an infrastructure for multi-center research was initiated (Fig. 1). Furthermore, a demographic survey of chiropractors in Norway was developed and performed by the participants as an extracurricular activity using the skills learned during the program.

A majority rated "Obtaining research clinic qualification" as very or extremely important and equally as important as obtaining PhD ECTS points for the program (Table 2). Further, gaining a better understanding of the research process outweighed the importance of academic or professional qualifications (Table 2). Seventeen stated that they wanted to participate in research projects with other colleagues and wanted to participate in a network of research clinics (Table 3).

Interestingly, all respondents agreed to the statement, "Research can help me in my clinical decision making." Participants realized that research must be read carefully and critically. Even though only a few students have continued working on their projects, eight still want to pursue a PhD in the future after completing the program. Nearly all are confident that they now have the tools to conduct smaller clinic-based projects (Table 3).

Suggestions for Improvement

The students are to be commended for undertaking the challenge of being a part-time student alongside full-time practice. It was therefore of utmost importance that the time on the program was well spent and that the topics covered were meaningful and relevant to the students throughout the learning process. This is further emphasized in the students' comments to how the program could

Table 2 - Participants' Responses to the Importance of Qualification Obtained From Attending

Answer Options	Extremely Important	Very Important	Moderately Important	Slightly Important	Not at All Important	Response Count
How important is obtaining ECTS points at MSc level for the program?	3	9	7	2	5	26
How important is obtaining ECTS points at PhD level for the program?	3	12	6	4	0	25
How important is obtaining qualification as a research clinic?	2	13	8	3	0	26
How important is obtaining CPD points awarded for program participation?	4	9	7	2	4	26
How important is just obtaining a better understanding of research methods?	11	13	1	0	0	25

Table 3 - Participants Grading of Question 30: "Participating at the Research Workshop has made me realise that:"

Answer Options	Agree	Unsure	Disagree	Response Count
I want to pursue a PhD in the future	8	15	3	26
I now have the tools to conduct smaller research projects in my own clinic	22	3	1	26
I want to participate in research projects with other colleagues	17	9	0	26
I want to participate as a research clinic	17	9	0	26
Everything that has reached publication must be true	2	1	23	26
Performing research is easier than I thought before the Research Workshop	3	3	20	26
Research is more complicated than I thought before the Research Workshop	14	5	7	26
I do not want to be involved in research after all	0	2	24	26
Research can help me in my clinical decision making	26	0	0	26

be improved (Table 4).

The organization of the program and its administration was commented on and suggestions for improvements were given. When asked directly, most gave praise to the organizers. A final comment from one of the participants summed it up:

> "It has been a great experience and I feel that I have learned a lot on how to perform research. It has also given me the insight on what is needed to start a PhD program. We have also been able to start KIP (network of research clinics) Norway which I think is of great importance for Norwegian chiropractors. First of all because we need more research, but also because it will help us to get a Norwegian chiropractic education."
> Q32 A4

Suggestions for Stakeholders

The participants were asked to give advice as to what the chiropractic community (i.e., NCA, ECU) can do to support chiropractors who want to pursue a career in research. Continued financial and political support for programs like this one was suggested, as well as allowing for research forums to keep the momentum going. Availability of a leading-edge research infrastructure is critically important for providing a supportive and nurturing environment for research. Making strong formal connections to universities and providing assistance for potential researchers to realize their projects was recommended by the participants. When asked "Would you like to recommend the Research Workshop to other colleagues?" the participants answered "Yes" unanimously.

DISCUSSION

Chiropractors with a fundamental understanding of science and the ability to critically evaluate the results of research are essential for the successful translation of scientific developments into clinical practice. Likewise, an understanding of the scientific process is favorable when contributing data to clinical studies. As such, the successful establishment of a network of trained research clinicians can provide quality data for larger projects and also give easy access to clinical data for young investigators. However, the training of clinicians in valid data collection can be done with less resource expenditure.

Although the students were generally satisfied with course content and organization, it is apparent that the program failed to prepare the students to produce a PhD protocol as the main outcome assessment since none of the students were able to produce a protocol of sufficient quality to obtain a passing mark. In a similar research program six research projects were developed from the 14 clinicians attending 10 weekly classes subsequent to a Basic Research Skills course.[7] Weekly meetings such as this may drive the writing process more efficiently and should be considered in future programs if the main outcome measure is to produce a research protocol. The inclusion of chiropractors who initially were not interested in a research career may have affected the outcome of this

Table 4 - A Selection of the Various Answers From 26 Participants to the Question, "Do you have any comments on how the programme could be improved?"

Respondent	Responses
A26	"Better access to important journals"
A10	"Not use so much time on statistics and more time on how to find the correct literature."
A16	"...more emphasis on the protocol from day one."
A17	"Give even better information from the start about the program and the different parts of it, and what the students can expect of the assignments and time limits."
A23	"Integrate more examples from chiropractic relevant studies to better understand the research topics/ lectures"
A24	"Longer and containing more examples of both quantitative and qualitative research"

The numbering of the comments is arbitrary and does not refer to the same participant throughout the survey.

project. Fewer and more dedicated participants will give a better student-to-tutor ratio that may influence the success of research project development.

Having access to supervision from experienced researchers seems to be essential for clinicians in developing a protocol at the PhD level. The students did not appear comfortable accessing support and working as a team in developing a project and the supervisors were not able to stimulate the students to meet the deadlines set for submitting a finished protocol. In future programs, the student-supervisor relationship must be formalized early on. The association between use of a mentor and program completion was not investigated. Mentoring has been associated with a wide range of favorable behavioral, attitudinal, relational, motivational, and career outcomes.[8] If a mentor system is chosen in a later program it is recommended that the program organizer ensures that the mentors are properly instructed in their role and that there is a structured follow up of the mentor-student relationship.

The off-campus accessibility of full-text biomedical databases as well as access to chiropractic-specific peer reviewed journals needs to be assured for future programs. Access to databases such as MANTIS may have helped the students in obtaining more relevant literature from the chiropractic profession. Using more of the chiropractic literature as examples during lectures with even more emphasis on student interaction during lectures should be considered.

It is important for everyone accessing research literature to have an understanding of basic statistical concepts and processes. This program endeavored to deliver a level of statistics appropriate for those deciding on an appropriate research model to answer a specific research question. It seems, however, that the unit involving "factor analysis" was inappropriate to the needs of the students. Many of the students had chosen a clinical trial as their research design to answer their question, while only one student was investigating questionnaire development. Time devoted to this subject could have been utilized in better understanding of statistical principles or, alternatively, giving more time to the process of preparing a protocol.

Even though chiropractors with a master's degree can embark on a PhD project at an established health research facility, there is an apparent lack of motivation. Other musculoskeletal health care professions face similar challenges in recruiting clinicians to research. Primary obstacles are lack of appropriate mentorship to cultivate interest in research and a financial disincentive to become a clinician-scientist.[9] The use of "seed" money to produce funding applications, protected time to conduct research, and mandatory research rotation during residency or graduate education programs have been suggested as potential models for attracting more clinicians to research.[10, 11] There is evidence that research experience during the first years after graduation and primary authorship of manuscripts are associated with higher interest in research and in embarking on a scientific career.[9, 12] National associations should be mindful of the favorable influence of supporting graduate education programs that stimulate research career for young clinicians and the positive effect it may have on the profession. There was an obvious difference in topic mastery between the recently graduated participants and those that had been in clinical practice the longest. This reflects another study showing that research skills and critical reading skills are not perceived as a required CPD[6] and is not typically offered as a CPD activity. Research skills can be included as an integral part of graduate education programs and be revisited through CPD events ensuring evidence-based life-long learning.

CONCLUSION

This pilot project raised awareness of research amongst the participants and gave them the tools to use and implement research in clinical practice. In addition it introduced the participants to research methods and gave them the tools and resources to embark on future research. The program was well received by the participants even though developing a complete research proposal as the final assessment was too challenging in the allocated time. Linking the Research Workshop to universities has been important in order to obtain academic qualification and to have access to teaching staff and supervisors, and it is highly recommended for similar initiatives.

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CONFLICTS OF INTEREST

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About the authors

Lise Lothe is with Oslo University Hospital and the University of Stavanger. Jennifer Bolton is a professor at the Anglo-European College of Chiropractic. Address correspondence to Lise Lothe, Grooseveien 95, 4879 Grimstad (e-mail: lrlothe@gmail.com). This article was received June 6, 2012, revised August 29, 2012, and accepted September 4, 2012.

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